UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/803,760	03/18/2004	Ryo Yamazaki	16004.1040	6690

35856 7590 04/05/2007

SMITH FROHWEIN TEMPEL GREENLEE BLAHA, LLC
Two Ravinia Drive
Suite 700
ATLANTA, GA 30346

EXAMINER	
JACKSON, BLANE J	
ART UNIT	PAPER NUMBER
2618	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/05/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/803,760	Applicant(s) YAMAZAKI ET AL.	
	Examiner Blane J. Jackson	Art Unit 2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 2, 6,11,12,17-20* is/are rejected.

7)☒ Claim(s) *3-5, 7-10 and 13-16* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 6, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura et al. (US 6,396,879) in view of Schlueter (US 6,166,598).

As to claim 1, Yoshimura teaches a method of detecting linear operation in a power amplifier, the power amplifier being operative to amplify an input signal for transmission, the method comprising the steps of:

Detecting the output signal of the power amplifier (figures 1 and 3, column 3, line 45 to column 4, line 23 and column 5, lines 17-25, a transmission power controller including coupler (6a) and detector (6)),

Converting the detected output signal into a digital signal (figure 3, A/D converter (7) coupled to the output of the detector (6)),

Examining the digital signal to determine the root-mean-square power of a portion of the digital signal (figure 3, column 5, lines 17-41, A/D output is supplied to a detection voltage generator (31) to undergo root-mean-square processing),

Decreasing the input power level of the input signal if the root-mean square power is below a first threshold level (figures 1-3, column 5, lines 17-33 and column 4,

lines 24-65, comparator (8) compares the output of the RMS power via a moving average calculator (33) to a reference voltage or threshold and outputs the compared result as the attenuation control signal to variable attenuator (4) to control the input power).

Yoshimura teaches a transmission power controller that examines the RMS of the detected digital output power but does teach also examining the digital signal to determine the peak power represented by the digital signal and decreasing the input power level of the input signal if the ratio of the peak power to the RMS power is below a first threshold level.

Schlueter teaches a power controller to control transmission power including an output power envelope detector coupled to an A/D converter, the output of the A/D converter is split to provide signals to a peak to average detector (180) that comprises a peak sample circuit (185) and an average sample circuit (183) and ratio circuit (193), figures 5-7, column 6, line 55 to column 7, line 32. Schlueter discloses the average sample circuit calculates an average of the power levels over a predetermined period of time whereas the peak sample circuit (185) calculates the average of the peak levels over a predetermined period of time whereas these two values are input to a ratio circuit (193) to produce a mean peak to average ratio of the amplified signal over a predetermined period of time, column 7, lines 33-58. Schlueter further discloses the output of the peak to average detector represents the mean peak to average power ratio and is applied to a comparator that is referenced to a desired mean peak to

average ratio set point to determined a control signal of the gain of power amplifier (171).

Since Schlueter also teaches a second outer control loop to control the gain of a variable amplifier at the input to the power amplifier rather in addition to an inner loop to control the gain of the power amplifier, column 9, lines 10-15, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the RMS/ average power sample based feedback circuit of Yoshimura in accordance to the peak - to - average detector of Schlueter to maintain the mean peak - to - average ratio as well as the desired average output power via the variable gain amplifier.

As to claim 2, Yoshimura teaches a variable attenuator to decrease the input power level of the input signal but does not teach a variable gain amplifier to decrease the power level.

Schlueter teaches a power output control circuit (figure 5) which includes a power amplifier (172), a variable gain amplifier (206), a coupler (176), a voltage detector (178) and a processor (180) where the variable gain amplifier being electrically coupled to the signal input of the power amplifier, the signal input of the variable gain amplifier receiving a modulated signal that has been modulated with a base band signal, the control input of the variable gain amplifier being used to decrease the input power level of the input signal to the power amplifier, figure 5, column 8, line 41 to column 9, line 10.

Since, Schlueter also teaches the variable gain amplifier can be located in a different portion of the RF path of the transmitter, column 9, lines 1-10, it would have

been obvious to one of ordinary skill in the art at the time of the invention to substitute the variable attenuator of Yoshimura for the variable gain amplifier of Schlueter for alternative signal gain control of the input power to the power amplifier.

As to claims 6 and 11, Yoshimura teaches a mobile station for use in a cellular system, the mobile station comprising a circuit for maintaining linear operation of a power amplifier, the circuit comprising the components of:

A power amplifier, *a variable attenuator*, a coupler, a voltage detector and a processor (figures 1 and 3, column 3, lines 45-23 and column 5, lines 17-55, coupler (61), detector (6) and detection voltage generator (31)),

The power amplifier having a signal input and a signal output (figure 3, power amplifier (5)),

The *variable attenuator* having a signal input, signal output and a control input, the signal output of the variable gain amplifier being electrically coupled to the signal input of the power amplifier, the signal input of the variable gain amplifier receiving a modulated signal that has been modulated with a base band signal, the control input of the variable attenuator being connected to a first control output of the processor (figure 3, column 4, lines 55-65, variable attenuator (4)),

The coupler being electrically coupled to the signal output of the power amplifier and operative, in cooperation with the voltage detector, to detect the envelope of an output signal at the signal output of the power amplifier and provide the detected

envelope to a detected signal input of the processor (figure 3, column 4, lines 40-54, coupler (6a)).

The processor being operative to receive the detected signal and determine the root-mean-square power of at lest a portion of the detected signal (column 5, lines 34-46, detection voltage generator (31)),

Adjust the first control output of the processor to limit the gain of the variable attenuator if the average of the root-mean-square power of at least a portion of the detected signal is below a first threshold level (column 4, line 55 to column 5, line 15, a comparator (8) compares the output signal of the root-mean-square processor with a reference signal or threshold and outputs the compared result as the attenuation control signal.

Yoshimura teaches a variable attenuator but does not teach a variable gain amplifier which is adjusted by the first control output of the processor.

Schlueter teaches a power output control circuit (figure 5) which includes a power amplifier (172), a variable gain amplifier (206), a coupler (176), a voltage detector (178) and a processor (180) where the variable gain amplifier being electrically coupled to the signal input of the power amplifier, the signal input off the variable gain amplifier receiving a modulated signal that has been modulated with a base band signal, the control input of the variable gain amplifier being connected to a first control output of the processor, figure 5, column 8, line 41 to column 9, line 10.

Since, Schlueter also teaches the variable gain amplifier can be located in a different portion of the RF path of the transmitter, column 9, lines 1-10, it would have

been obvious to one of ordinary skill in the art at the time of the invention to substitute the variable attenuator of Yoshimura for the variable gain amplifier of Schlueter for alternative signal gain control of the input power to the power amplifier.

Yoshimura of Yoshimura modified teaches a processor to receive the detected signal and determine a root-mean-square power of at least a portion of the detected signal and adjust the first control output of the processor to limit the gain of the variable gain amplifier is below a first threshold level but does not teach the processor being operative to also receive and determine the peak power of the detected signal and adjust the gain of the variable gain amplifier in accordance to the ratio of the peak power to the root-mean-square power.

Schlueter teaches a power controller to control transmission power including an output power envelope detector coupled to an A/D converter, the output of the A/D converter is split to provide signals to a peak to average detector (180) that comprises a peak sample circuit (185) and an average sample circuit (183) and ratio circuit (193), figures 5-7, column 6, line 55 to column 7, line 32. Schlueter discloses the average sample circuit calculates an average of the power levels over a predetermined period of time whereas the peak sample circuit (185) calculates the average of the peak levels over a predetermined period of time whereas these two values are input to a ratio circuit (193) to produce a mean peak to average ratio of the amplified signal over a predetermined period of time, column 7, lines 33-58. Schlueter further discloses the output of the peak to average detector represents the mean peak to average power ratio and is applied to a comparator that is referenced to a desired mean peak to

average ratio set point to determined a control signal of the gain of power amplifier (171).

Since Schlueter also teaches a second outer control loop to control the gain of a variable amplifier at the input to the power amplifier rather in addition to an inner loop to control the gain of the power amplifier, column 9, lines 10-15, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the RMS/ average power sample based feedback circuit of Yoshimura in accordance to the peak - to - average detector of Schlueter to maintain the mean peak - to - average ratio as well as the desired average output power via the variable gain amplifier.

As to claim 12, Schlueter of Yoshimura modified teaches the mobile station of claim 11 wherein the processor is operative to adjust the gain of the variable gain amplifier by decreasing the gain if the ratio is below a minimum threshold (column 8, lines 5-25).

Claims 17, 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura et al. (US 6,396,879) and Schlueter (US 6,166,598) in view of Hirvilampi (US 6,351,189).

As to claims 17, 18 and 20, Yoshimura modified teaches the mobile station of claim 11 but does not teach the mobile station further comprising a temperature sensor and a voltage sensor for measuring the voltage level of a source providing power to the mobile station and the processor is further operative to adjust the gain of the variable

gain amplifier in accordance with the value of the ratio and the temperature reading of the sensor.

Hirvilampi teaches a method for auto-biasing an amplifier comprising an auto-bias feedback loop that continuously adjusts the bias condition of an amplifier to a wanted state during amplifier operation by monitoring the operating state of the amplifier and controlling the amplifier bias so as to control the amplifier operating point sufficiently to compensate for variations in amplifier electrical characteristics, amplifier load, amplifier temperature, input signals and the modulation scheme used, column 2, lines 25-46. Hirvilampi teaches in operation, a measurement device measure an operating parameter of the amplifier, a voltage, current or temperature and conveys the bias level metric to control device (322) in response to variations in the bias level metric, figures 3 and 4, column 5, lines 43-65. Hirvilampi discloses an example of a measurement device (320) comprises a sensing resistor (R41) coupled to power supply (316) to provide a voltage drop corresponding to the magnitude of the current where the directly sensed voltage and indirectly sensed current sourced by the power supply is coupled to control device (322) for subsequent adjustment to the bias control of the amplifier, figure 4, column 7, lines 34-60.

Since Hirvilampi teaches alternative methods to monitor and self bias a power amplifier with application to mobile telephones, column 1, lines 10-22, it would have been obvious to one of ordinary skill at the time of the invention to modify the variable gain amplifier control system of Yoshimura to also consider any one or a combination of the operating parameters or bias level metrics of Hirvilampi to control the amplifier

operating point sufficiently to compensate for variations in the amplifier electrical characteristics including the temperature of or the voltage/ current to the amplifier.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura et al. (US 6,396,879) and Schlueter (US 6,166,598) in view of Pehlke (US 2002/0094791).

Yoshimura modified does not tech the mobile station of claim 11 further comprising a reverse power detector for detecting a voltage standing wave ration and the processor is further operative to adjust the gain of the variable gain amplifier in accordance with the value of the ratio of the peak power to the RMS power and the voltage standing wave ratio.

Pehlke teaches a mobile station comprising apparatus and methods for monitoring and controlling a variable gain amplifier (636) and the power amplifier (610) linearity including a forward ((624a) and a reverse (642b) power detector to provide forward and reverse power signals to a processor (634) for determining a voltage standing wave ratio and the processor is further operative to adjust the gain of the variable gain amplifier in accordance with the comparison of the voltage standing wave ratio and other signal processing operations, figure 6, paragraphs 0031-0034, directional coupler (621a), power detector (624b) and A/D converter (632b, and the processor may implement other computing or signal processing operation in addition to the comparing and control operations to control the variable gain circuit (636).

Since Pehlke also teaches the monitoring of the forward power and the power of the forward power harmonics as input information into the power controller processor, figure 6, it would have been obvious to one of ordinary skill in the art at the time of the invention to further modify Yoshimura modified with the additional amplified signal output characteristics as monitored and processed by Pehlke to accurately adjust the variable gain amplifier.

Allowable Subject Matter

Claims 3-5, 7-10 and 13-16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

As to claims 3, 4, 7-10, 13 and 14, the prior art made of record does not teach increasing or decreasing the input power level of the input signal with reference to a plurality of thresholds.

As to claims 5 and 16, the prior art made of record teaches samples taken at a predetermined time but does not teach examining the digital signal comprises identifying the mid-amble portion of the signal and determining the RMS power of the mid-amble of the signal.

As to claim 15, the prior art made of record does not teach detecting the synchronization bit sequence within the digital signal and determining the RMS power of the synchronization bit sequence.

Conclusion

The prior art made of record and not relied upon but considered pertinent to applicant's disclosure includes Staudinger et al. (US 6,407,634).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Blane J. Jackson whose telephone number is (571) 272-7890. The examiner can normally be reached on Monday through Thursday, 7:30 AM-6:00 PM, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Urban can be reached on (571) 272-7899. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Blane J. Jackson